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The Research Institute of the Federal Employment Agency
IAB

Social desirability bias in survey measures of illicit work

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Motivation: Estimation of structure of illicit work…

- Indirect Methods (Macro Approaches)
  - National Accounting Approaches (employment gap methods, income gap methods)
  - Monetary Approaches (transaction approach, currency demand approach)
  - Physical Input Approach (electricity consumption method)
  - Hidden Variable Approach (model-based, i.e. LISREL)

- Direct Methods (Micro Approaches)
  - Tax Auditing & Compliance Methods
    - declared and actual income
  - Survey Data
    - black activities, tax evasion, tax morale
  - Administrative Data
    - Official Number of People found Guilty (Financial Control Department for Illicit Work (FKS))

Measurement in Surveys: What has been done?

Application of **various approaches** in surveys, e.g.:

- the “Casual Approach”, “Everybody Approach” or the “Other People Approach” forgiving wording, asking about long periods/distant past, loading of questions, paraphrasing,
- Mode change: self-administration methods

(Bradburn et al., 2004)

Variation of estimates in surveys:

Source	Filter (y/n)	Hours per week	N	Earnings per hour	N
Feld and Larsen 2006 (2008: 2)	y	7.3	46	9.2	94
	n	0.31	1.083	0.80	1.083
Eurobarometer 2007 (European Commission, 2007: 96)	y	12.5	39	12.0	27
	n	0.22	1.510	0.21	1.510

no use of dejeopardi-zing techniques to inquire structure of illicit work (esp. in CATI mode)

-> Recommendation to “consider alternatives to standard questions […]”.

(Bradburn et al., 2004: 81; cf. also Boockmann et al., 2010: 100)

Advancing … the Item Count Technique (ICT)

(Droitcour 1991)

Group A (Long List)	**Group B (Short List)**
Did you ever keep a book of household accounts?	Did you ever keep a book of household accounts?
Does you household contain more TV‘s then members?	Does you household contain more TV‘s then members?
Do you own a mobile phone?	Do you own a mobile phone?
Did you carry out any illicit work for a private individual this year [2010]?	
How many items apply to you *(were answered with ‚YES‘)*?	

Respondent receives a list of items and is asked to answer how many of these binary items apply (i.e. how many yeses), but not which ones! Estimated prevalence of illicit work = difference between subsample means

Empirical evidence regarding the ICT

- positive evidence:
  - ICT outperforming DQ (Dalton et al., 1994; Wimbush and Dalton, 1997; LaBrie and Earleywine, 2000; Rayburn et al., 2003; Tsuchiya et al., 2007; Holbrook and Krosnick, 2010; Coutts and Jann 2011)

- mixed evidence:
  - ICT not outperforming DQ (Ahart and Sackett, 2004; Tourangeau and Yan, 2007)

- Comparison of direct questioning (DQ) with the novel approach to ask quantitative sensitive questions, namely the

  … Item Sum Technique (IST)

  regarding hours spent in and earnings from illicit work (CATI).

Hypotheses

- We hypothesize that IST > DQ

  the IST will yield higher estimates compared to direct questioning (‘more-is-better assumption’)

  -> anonymity of respondent answer, simple instructions, easy comprehension for respondents and easy to administer, since no randomization device necessary.

Project Outline

- Cooperation of IAB and University of Leipzig
  - Implemented as follow-up questions in the framework of an RRT-study,
  - questionnaire covering items on employment, predictors of illicit work (opportunity structures, attitudes and norms, networks, perceived costs and benefits) and demographics,
  - experience with asking sensitive questions on the telephone (Krumpal 2010)

- Implementation as split-ballot experiment using direct questioning as control.

- Two random samples (n=3.211)
  - register sample of employed persons (18-70) and register sample of basic income support recipients (18-64) in Germany (fieldwork: ForschungsWerk); RR1: 17.5 %

Definition of Illicit Work

- With ‚illicit work' we refer to all labor, that produces an income, however, is concealed from the authorities, e.g. in order to avoid paying taxes or social security contributions.

- Criminal activities, such as the production of drugs and drug dealing do however NOT count as illicit work.

Implementation of the IST: Single-List Design

(cf. ICT Droitcour 1991)

Group A (Long List)	**Group B (Short List)**
C1: How many hours did you watch TV last week? S1: How many hours do you usually work illicitly per week?	C1: How many hours did you watch TV last week?
Please sum up the answer to both questions, please, do not report individual answers.	
Group A (Long List)	**Group B (Short List)**
C2: How high are your monthly costs for your apartment respectively your house? S2: How high are your usual earnings per month working illicitly?	C2: How high are your monthly costs for your apartment respectively your house?
Please sum up the answer to both questions, please do not report individual answers.	

Preceded by brief definitions of illicit work and instructions regarding the technique if in treatment group. Also questions regarding the prevalence by means of DQ resp. RRT.

Number of cases assigned to treatments

	Employed	Benefit Recipients	Overall sample	Item Nonresponse	
				Hours	Income
DQ	565	580	1.145	3	6
IST					
Short List	496	460	956	2	44
Long List	459	377	836	2	26
DQ				0	0
RRT ref	93	181	274		
Overall sample	1.613	1.598	3.211	7	76

Estimators IST I – Univariate Estimates

- Again, let *S* be the sensitive item of interest and *C* be the non-sensitive control item. Observed is:

$$Y_i = \begin{cases} S_i + C_i & \text{if } i \text{ belongs to Group } A \text{ (Long List)} \\ C_i & \text{if } i \text{ belongs to Group } B \text{ (Short List)} \end{cases}$$

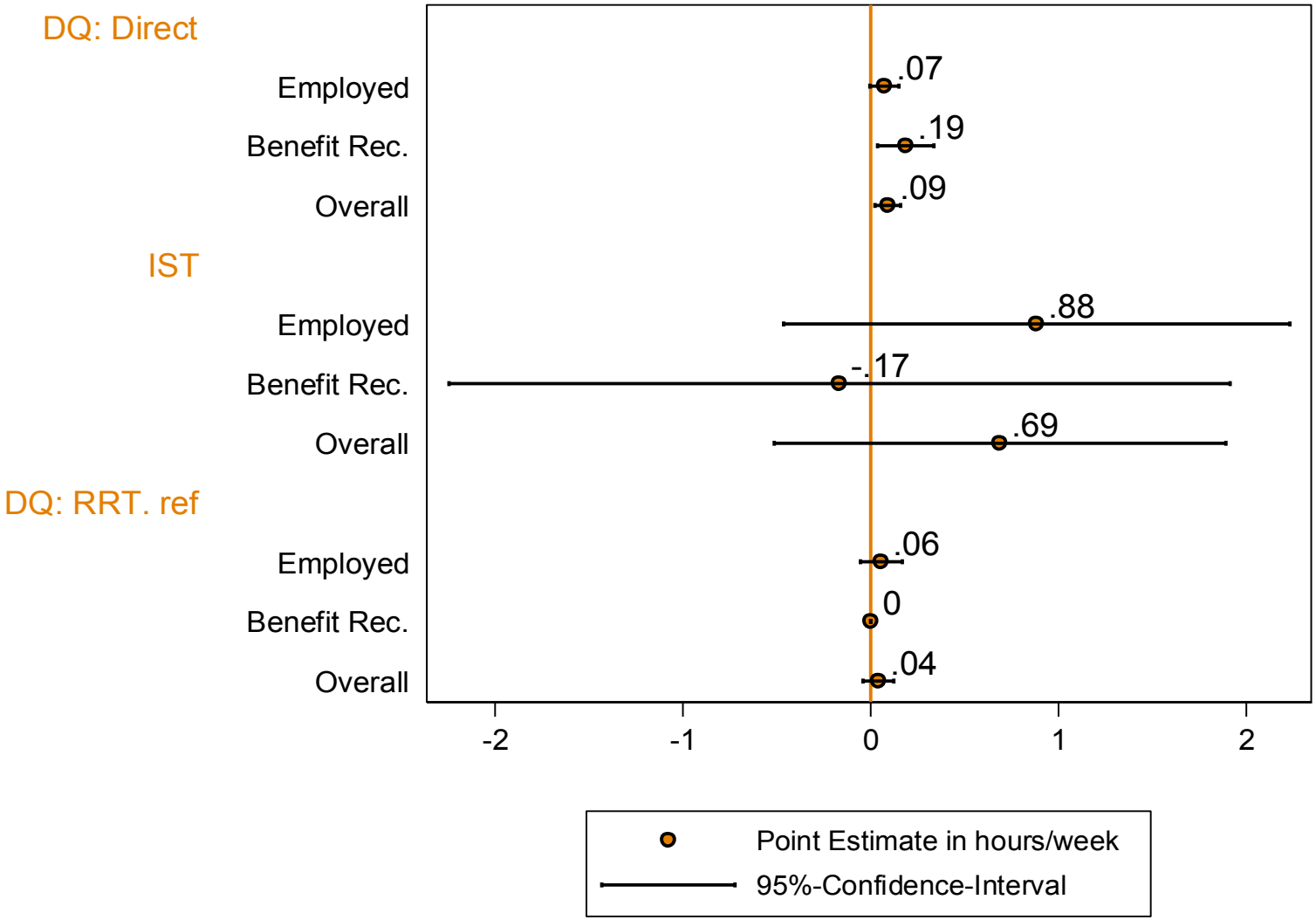
- The mean difference of *Y* between the two groups is an unbiased estimate of the population mean of *S*:

$$\bar{S} = \bar{Y}^A - \bar{Y}^B = \frac{1}{N^A}\sum_{i \in A} Y_i - \frac{1}{N^B}\sum_{i \in B} Y_i$$

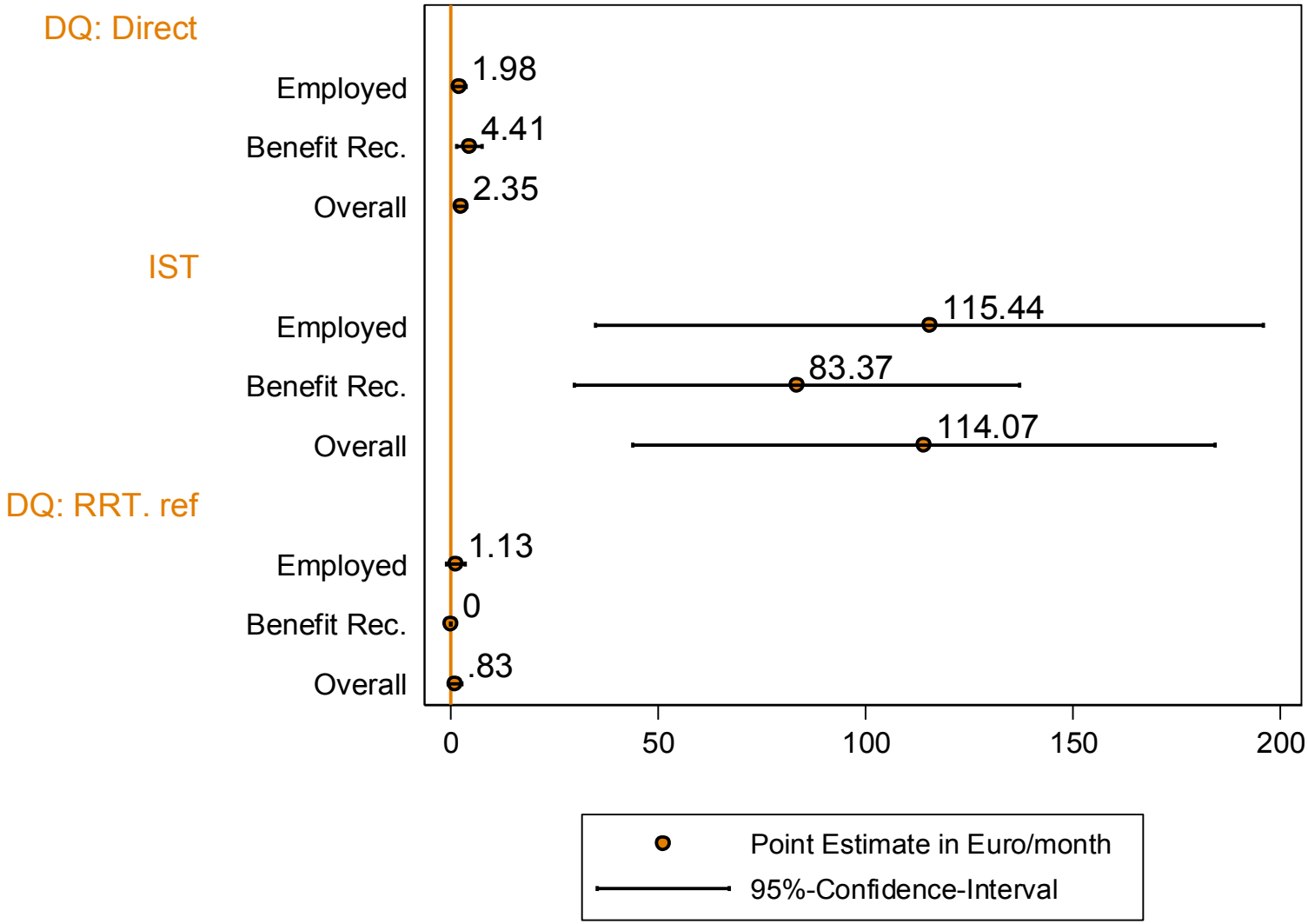
- The sampling variance of the mean estimate of *S* can be derived as:

$$\hat{V}\left(\bar{S}\right) = \hat{V}\left(\bar{Y}^A\right) + \hat{V}\left(\bar{Y}^B\right) = \frac{1}{N^A(N^A-1)}\sum_{i \in A}(Y_i - \bar{Y}^A)^2 - \frac{1}{N^B(N^B-1)}\sum_{i \in B}(Y_i - \bar{Y}^B)^2$$

Univariate Estimates: Hours per Week



Univariate Estimates: Earnings per Month



Estimators IST II – Multivariate Models

- Let $T_i = \begin{cases} 1 & \text{if } i \in A \\ 0 & \text{if } i \in B \end{cases}$ so that $Y_i = T_i S_i + C_i$

- Suppose that *S* and *C* both depend linearly on a vector of covariates X (including a constant), then we can model *Y* as

$$Y_i = T_i(X_i'\beta + \upsilon_i) + (X_i'\gamma + \nu_i) = T_i X_i'\beta + X_i'\gamma + \varepsilon_i \quad \text{with } E(\upsilon_i) = E(\nu_i) = E(\varepsilon_i) = 0$$

- An estimate of parameter vector β can be obtained by least squares regression or, assuming bivariate normally distributed errors, by maximizing the log likelihood

$$\ln L = \sum_{i=1}^{N} T_i \ln\left[\frac{1}{\sqrt{\sigma_\upsilon^2 + \sigma_\nu^2 + 2\rho\sigma_\upsilon\sigma_\nu}}\phi\left(\frac{Y_i - X_i'\beta - X_i'\gamma}{\sqrt{\sigma_\upsilon^2 + \sigma_\nu^2 + 2\rho\sigma_\upsilon\sigma_\nu}}\right)\right] + (1 - T_i)\ln\left[\frac{1}{\sigma_\nu}\phi\left(\frac{Y_i - X_i'\gamma}{\sigma_\nu}\right)\right]$$

where ϕ() is the standard normal density and ρ is the error correlation.

Multivariate Models: (log) Earnings from Illicit Work

- **Expected Utility:**
  benefits: marginal tax/benefit withdrawal rate, preferred working hours costs: perceived risk (risk of detection x severity of punishment)
- **Opportunity structure:**
  qualification, occupation, network resources
- **Norms:**
  prevalence of illicit work among one's network, attitudes towards illicit work
- **Demographic Variable:**
  gender, age, region

Multivariate Models: Selected Results

Sample: (ref. empl. sample)	Benefit recipient sample	**0.32*** (0.13)
Qualification: (ref. voc. training)	None	0.04 (0.15)
	College level	**-0.29+** (0.15)
Occupation: (ref. service)	Green	0.02 (0.30)
	Production	**-0.23+** (0.12)
	Other	-0.09 (0.19)
Labor income: (ref. 0-800 Euro)	801-3.400	0.21 (0.15)
	> 3.400 Euro	**0.62**** (0.22)
…		….
Constant		-0.44* (0.21)
Wald chi2 (22)		32.29+
N		1.722

Findings, Limitations & Future Work

- Generalizing the item count technique we have presented a new privacy preserving technique for metric sensitive items and applied it in a study on illicit work
- Results indicate that
  - IST can be fruitful in yielding higher estimates of the socially undesirable behaviour than direct questioning.
  - Assuming multivariate normality we can estimate regression models of the sensitive item by MLE
- Limitations
  - Differential item nonresponse between treatment and control contaminates randomization
  - Large standard errors of point estimates and regression coefficients
- Future improvements:
  - Improve estimation strategy (censoring of dependent variable at zero, double hurdle models)
  - In future studies: Increase power by double-list design; reduce item-nonresponse

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Introduction: Illicit Work

A TAXONOMY OF UNDERGROUND ECONOMIC ACTIVITIES

	Monetary Transactions		Nonmonetary Transactions	
Illegal Activities	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling and fraud.		Barter: drugs, stolen goods, smuggling, etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
Legal Activities	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

Source: Rolf Mirus and Roger S. Smith (1997, p. 5), with additional remarks.

(Schneider, F./Enste, D. 2000: 79)

Structure of Illicit Work

Sup. / Dem.	Individual/Household	Enterprise
Individual/ Household	Cleaning, Babysitting, Garden Work, repairs	envelope wages, undeclared jobs in gastronomy, construction
Enterprise	Building repairs, caretaking, car repair, etc. that are provided without invoice	Sub-contractors (e.g. construction)

Univariate Estimates: Hours per Week

	Employed	Benefit Recipients	Overall sample	N
DQ **S: i.w.**	0.07° (0.04)	0.19* (0.08)	0.09* (0.04)	1.142
IST **S: i.w.**	0.88 (0.69)	-0.17 (1.06)	0.69 (0.61)	1.788
C: TV	11.33*** (0.44)	15.29*** (0.70)	11.89*** (0.39)	
DQ **RRT ref**	0.06 (0.06)	0.00 (0.00)	0.04 (0.04)	274

Standard errors in parentheses; significant at levels: ° p<.1, * p<.05, ** p<.01, *** p<.001; selection weights applied ; S = hours of illicit work per week (item included in long list only); C = hours watched TV last week (item included in both short and long list)

Univariate Estimates: Hours per Week

	Employed	Benefit Recipients	Overall sample	N
DQ **S: i.w.**	0.07° 0.04	0.19* 0.08	0.09* 0.04	1.142
IST **S: i.w.**	0.89 0.69	-0.17 1.06	0.69 0.61	1.788
C: TV	11.33*** 0.44	15.29*** 0.70	11.89*** 0.39	
DQ **RRT ref**	0.06 0.06	0.00 0.00	0.04 0.04	274

Standard errors in parentheses; significant at levels: ° p<.1, * p<.05, ** p<.01, *** p<.001; selection weights applied ; S = hours of illicit work per week (item included in long list only); C = hours watched TV last week (item included in both short and long list)

Univariate Estimates: Earnings per Month

	Employed	Benefit Recipients	Overall sample	N
DQ S: i.w.	1.98* (0.82)	4.41** (1.52)	2.35** (0.73)	1.139
IST S: i.w.	115.44** (41.11)	83.37** (27.39)	114.07** (35.89)	1.722
C : housing	698.00*** (20.07)	512.65*** (10.99)	671.11*** (17.30)	
DQ RRT ref	1.13 (1.13)	0.00 (0.00)	0.83 (0.83)	274

Standard errors in parentheses; significant at levels: ° p<.1, * p<.05, ** p<.01, *** p<.001; selection weights applied ; S = income per month from illicit work (item included in long list only); C = monthly costs for housing (item included in both short and long list)